STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
CONS 338 – ADVANCED MECHANICS OF MATERIALS

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Canino School of Engineering Technology

Department: Civil and Construction Technology

Semester/Year: Fall 2018

A. **TITLE**: Advanced Mechanics of Materials

B. **COURSE NUMBER:** CONS 338

C. **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

 # Credit Hours: 3
 # Lecture Hours: 2 **per week**
 # Lab Hours: **per week**
Other: (1) two-hour recitation **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY: None:** ☒ **Yes:** GER
***If course satisfies more than one*:** GER

F. **SEMESTER(S) OFFERED: Fall** ☐ **Spring** ☒ **Fall & Spring** ☐

G. **COURSE DESCRIPTION:**

This course includes analysis of statically indeterminate structures and deflections using the principle of virtual work. Special topics in stress analysis such as internal loads due to temperature, torsion, unsymmetrical bending circumferential stresses, buckling and beams on an elastic foundation are included. The finite element method is introduced.

H. **PRE-REQUISITES: None** ☐ **Yes** ☒ **If yes, list below:**

CONS 336 (Structural Analysis)

CO-REQUISITES: None ☒ **Yes** ☐ **If yes, list below:**

I. STUDENT LEARNING OUTCOMES: (*see key below*)

By the end of this course, the student will be able to:

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
a) Calculate the deflection of a truss panel point using an energy method.			5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
b) Calculate the shear and bending moments in a rigid frame resulting from temperature changes or differential settlement.			5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
c) Calculate torsion stresses and deflections for nonsymmetrical members.			5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
d) Calculate the shear center of an nonsymmetrical member.			5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
e) Calculate the stresses and deflections associated with unsymmetrical bending of a member.			5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets

KEY	**Institutional Student Learning Outcomes [ISLO 1 – 5]**
ISLO #	**ISLO & Subsets**
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

*Include program objectives if applicable. Please consult with Program Coordinator

J. APPLIED LEARNING COMPONENT: Yes ☐ No ☒

If YES, select one or more of the following categories:

- ☐ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service
- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship (program, class, project)

K. TEXTS:

Boresi, A. P. and Schmidt, R. J, (2003) Advanced Mechanics of Materials, 6th Ed. Wiley

L. REFERENCES:

M. EQUIPMENT: None ☒ Needed:

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

- **Exams**
- **Quizzes**
- **Homework**

P. DETAILED COURSE OUTLINE:

I. Introduction
- **A. Review of strength of materials**
- **B. Principal stresses theory and calculation**
- **C. Mohr's circle**
- **D. Octahedral and maximum shear stress**
- **E. Stress-Strain and temperature relationships**
- **F. Strain energy**
- **G. Stress concentrations**

II. Virtual work principles
- **A. Principle of virtual displacements**
- **B. Virtual displacements of a particle and external virtual work**
- **C. Virtual displacements of deformable bodies and internal virtual work**

III. Energy methods
- **A. Elastic strain energy for normal stress**
- **B. Elastic strain energy for shear stress**
- **C. Strain energy for general state of stress**

D. Work and energy under a single load
E. Work and energy under several loads. Principle of superposition.
F. Castigliano's theorem

IV. Torsion
A. Plastic deformation of circular shafts
B. Circular shafts made of elastoplastic material
C. Membrane analogy
D. Torsion of non-circular sections
E. Torsion of thin walled circular shafts

V. Curved beams
A. Circumferential stresses
B. Radial stresses

VI. Column buckling
A. Euler's formula
B. Extension of Euler's formula to fixed end and other conditions
C. Analysis of eccentric loading using the secant formula
D. Design of columns for eccentric loads

VII. The finite element method
A. Finite element approach to structural analysis
B. Interpolation concepts
C. Energy equivalence for member loading
D. Numerical integration
E. Truss finite element analysis
F. Beam finite element analysis
G. Frame finite element analysis

Q. <u>LABORATORY OUTLINE</u>: None ☒ Yes ☐